



**SELECTED PHYSICAL, SHELLING,  
AND GERMINATION PROPERTIES  
OF THE NEW SPANISH PEANUT VARIETIES  
'SPANCROSS' AND 'TIFSPAN'**

---

**ARS-S-24  
October 1973**



AGRICULTURAL RESEARCH SERVICE • U.S. DEPARTMENT OF AGRICULTURE



## ACKNOWLEDGMENTS

The Georgia Seed Development Commission and the Southwest Georgia Branch Station, Plains, Georgia, made this study possible by supplying peanuts that were considered representative of those produced during normal crop years. Use of practices advocated by the Georgia Cooperative Extension Service was also a primary contribution toward obtaining valid comparisons during this study.

Larry S. Creel, agricultural commodity grader at the National Peanut Research Laboratory, made most of the property measurements and assisted with the shelling tests. William G. Ferguson, engineering technician at the National Peanut Research Laboratory, conducted the dye-penetrant tests and determined the pod damage. Robert A. Tennille, engineering technician at the National Peanut Research Laboratory, was responsible for conducting the germination tests.

## CONTENTS

	Page
	iii
Acknowledgments .....	1
Summary .....	1
Introduction .....	1
Preparation for Test .....	1
Data and Results .....	2
Farmers Stock Value .....	2
Precleaning .....	4
Pod and Hull Properties .....	4
Kernel (Seed) Properties .....	5
Shelling Data .....	8
Conclusions .....	9
Recommendations .....	10
Literature Cited .....	11

## Illustrations

### Fig.

1. General outline of studies conducted with 'Spancross', 'Tifspan' and 'Argentine' peanuts .....	3
2. General shape categories of 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	5
3. Pod size distribution of 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	6
4. Kernel size distribution of 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	7

## Tables

1. Planting and harvesting data for 'Argentine', 'Spancross', and 'Tifspan' peanuts grown at Southwest Georgia Branch Station, Plains, Georgia, 1971 .....	2
2. Rainfall data for the Southwest Georgia Branch Station, Plains, Georgia, during Crop Year 1971 .....	2
3. Grades and market value of 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	4
4. Precleaning of 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	5
5. Some physical properties of the pod and hull of 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	6
6. Some physical properties of 'Argentine', 'Spancross', and 'Tifspan' kernels .....	7
7. Germination percentages of 'Argentine', 'Spancross', and 'Tifspan' seed .....	8
8. Shelling data for 'Argentine', 'Spancross', and 'Tifspan' peanuts .....	9
9. Performance of slotted hole vibrating screens in separating shelled from unshelled 'Argentine', 'Spancross', and 'Tifspan' peanuts after first stage sheller .....	9

# SELECTED PHYSICAL, SHELLING, AND GERMINATION PROPERTIES OF THE NEW SPANISH PEANUT VARIETIES, 'SPANCROSS' AND 'TIFSPAN'

By JAMES I. DAVIDSON, JR., RAY O. HAMMONS, WAYNE DILLARD, and ROBERT B. MOSS<sup>1</sup>

## SUMMARY

A study was conducted to determine some physical and shelling properties of 'Argentine', 'Spancross', and 'Tifspan' varieties of Spanish peanuts. The primary objective was to provide information that would be helpful in the commercial shelling of two new peanut varieties, 'Spancross' and 'Tifspan'. Peanuts of a common variety ('Argentine') were used as a standard for comparison. Secondary objectives were to provide basic information for designing new shelling equipment and for improving the performance of existing shelling equipment.

Some physical properties were approximately the same for all three varieties. These similar properties greatly simplified the comparisons for this study and minimized the differences between varieties in market value, outturns, rates of shelling, and shelling efficiencies.

Generally, 'Spancross' and 'Tifspan' had better shelling properties than 'Argentine' and no serious problems are expected in the commercial shelling of these peanuts.

Data obtained in this study and from earlier tests with 'Starr' and 'Argentine' peanuts indicate that many of the physical and shelling properties of 'Spancross' and 'Tifspan' peanuts are between those of the common varieties, 'Argentine' and 'Starr'. Thus, the information contained within this report together with shelling

experience with 'Argentine' and 'Starr' peanuts should be very helpful to the industry in shelling 'Spancross' and 'Tifspan' peanuts.

Based on the physical and shelling properties of these three varieties, recommendations were made to improve the commercial precleaning, handling, and shelling of these peanuts.

## INTRODUCTION

Very little information has been published (1, 6, 9, 12)<sup>2</sup> on the physical and shelling properties of peanuts. This type of information is needed to design new shelling equipment, improve the performance of existing shelling equipment and, shell peanuts of newly developed varieties.

In this study, some physical and shelling properties of two new Spanish varieties, 'Spancross' and 'Tifspan', were determined and compared to the properties of a common Spanish variety, 'Argentine'. This work was requested by the Georgia Cooperative Extension Service and the peanut industry. Information contained in this report supplements other research information reported for 'Spancross' (3) and 'Tifspan' (4) peanuts at their release in 1970.

## PREPARATION FOR TEST

Peanuts of 'Argentine', 'Spancross', and 'Tifspan' varieties were grown during crop year 1971 at the Southwest Georgia Branch Station, Plains, Georgia, using the best known growing and harvesting practices. Agronomic data are presented in tables 1 and 2. The peanuts were left in the inverted windrow 2 to 4 days and good weather prevailed during the harvest season. Peanuts were picked (by combine) at 13 to 20 percent kernel moisture content and artificially dried to about 11 percent kernel moisture

<sup>1</sup> Respectively, mechanical engineer, U.S. Department of Agriculture, Agricultural Research Service, National Peanut Research Laboratory, Dawson, Georgia; research geneticist, U. S. Department of Agriculture, Agricultural Research Service, and research associate in Genetics, University of Georgia, College of Agriculture Experiment Stations, Coastal Plain Station, Tifton, Georgia; agricultural assistant division director, Georgia Seed Development Commission, Plains, Georgia; superintendent, Southwest Georgia Branch Station, Plains, Georgia.

<sup>2</sup> Numbers in parentheses refer to items in "Literature cited" p. 11.

TABLE 1.—*Planting and harvesting data for 'Argentine', 'Spancross', and 'Tifspan' peanuts grown at Southwest Georgia Branch Station, Plains, Georgia, 1971*

Variety	Planting dates	Digging dates	Picking dates	Average kernel moisture at picking (% wet basis)
'Argentine'	May 6	September 2 and 3	September 6 and 7	15.6
'Spancross'	May 5	September 6	September 8	18.2
'Tifspan'	May 7	September 7 and 10	September 9, 10, 13, and 14	18.1

<sup>1</sup> Light rain fell on Argentine peanuts while they were in the inverted windrows.

TABLE 2.—*Rainfall at the Southwest Georgia Branch Station, Plains, Georgia, during 1971 crop year*

Month	Rainfall (inches)	Month	Rainfall (inches)
January	3.76	June	6.91
February	7.26	July	12.21
March	8.39	August	3.58
April	4.21	September	1.87
May	4.38		

content using drying practices advocated by the Georgia Cooperative Extension Service. The peanuts were dried and stored by the Georgia Seed Development Commission at Plains, Georgia. Soil type, climatic conditions, cultural practices, herbicide and pesticide treatments, harvesting, drying and storage practices were the same for peanuts of all three varieties and no abnormal conditions were noted during the production history of these peanuts.

Digging dates were selected on the basis of visual observation of the vines, pegs and inside color of the hulls as well as the normal practical limitations. The maturity of the three varieties by this standard method appeared to be approximately equal. Arginine maturity indexes (AMI) were determined for these peanuts by Dr. Clyde T. Young of the Georgia Experiment Station, Experiment, Georgia. The average AMI values reported were 42.6, 39.7, and 50.0 for the 'Argentine', 'Spancross', and 'Tifspan' peanuts, respectively, indicating that the 'Argentine' and 'Spancross' peanuts were more mature than the 'Tifspan' peanuts.

After picking and drying, the peanuts were stored for about 6 months at Plains, Georgia, and then removed from storage and delivered to the National Peanut Research Laboratory at

Dawson, Georgia. Peanuts of each variety were subjected to the study outlined in figure 1. The peanuts were cleaned with a commercial-type precleaner and the shelling properties were determined with a  $\frac{1}{4}$ -size commercial-type sheller. Physical properties of the pod, hull, and seed were determined by using standard laboratory equipment, such as micrometers, electronic counter, unit containers, and Federal-State Inspection Service equipment. Germination equipment and procedures were as recommended by the Georgia State Seed Testing Laboratory.

## DATA AND RESULTS

### Farmers Stock Value

The official grades and market value per ton (13) were approximately the same for farmers stock peanuts of all three varieties (table 3). The 'Argentine' peanuts had about twice as much foreign material as the newer varieties, but this variation probably resulted from differences in combine separating efficiencies and not from varietal differences.

Since the AMI data supplied by Dr. Clyde Young indicated that these 'Tifspan' peanuts (CY 1971) were relatively immature, official grade data for crop year 1972 were reviewed to see if 'Tifspan' peanuts would grade better if allowed to mature. The average grades of sound mature kernels<sup>3</sup> (SMK) plus sound split kernels for peanuts grown at the Southwest Georgia Branch Station during CY 1972 were 66.7, 67.3, and 64.7 for the 'Argentine', 'Spancross', and 'Tifspan', respectively, indicating that 'Tifspan' may produce a lower percentage of kernels retained on the 15/64-inch screen than the 'Argentine' and 'Spancross' peanuts.

<sup>3</sup> "Kernel" is standard Federal-State Inspection Service terminology for the peanut seed.

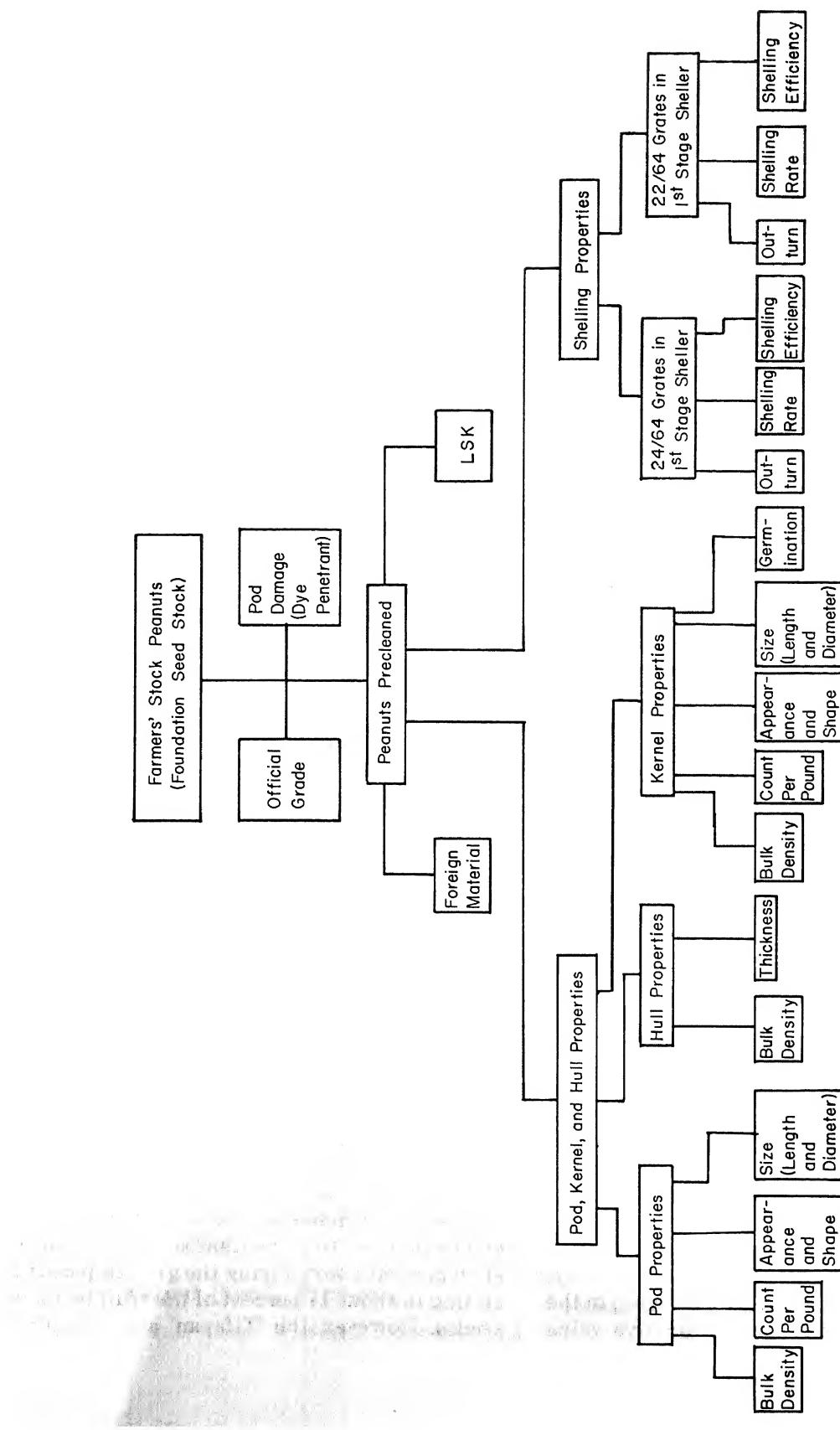


FIGURE 1.—General outline of studies conducted with 'Spancross', 'Tifspan', and 'Argentine' peanuts.

TABLE 3.—*Grades and market value of 'Argentine', 'Spancross', and 'Tifspan' peanuts*

Grade criteria	Grade or market value (percent)		
	'Argentine'	'Spancross'	'Tifspan'
Sound mature kernels (SMK) .....	62	63	63
Sound split kernels .....	6	6	5
SMK plus sound split kernels .....	68	69	68
Other kernels .....	8	7	8
Total damage (including damaged split kernels) .....	1	0	1
Total kernels .....	77	76	77
Total hulls .....	23	23	23
Total kernels and hulls .....	100	99	100
Foreign material .....	10	4	5
Loose shelled kernels .....	1	2	1
Kernel moisture .....	7.2	7.1	7.3
Market value per ton of net farmers stock .....	281.67	284.27	282.27

### Precleaning

Precleaning removed most of the foreign material and some of the loose shelled kernels (LSK) from peanuts of all three varieties (table 4). The material removed with the LSK by the precleaner from the 'Spancross' and 'Tifspan' peanuts generally contained more whole kernels and small pods (nubbins) than did the material removed with the LSK from the 'Argentine' peanuts—probably because of the smaller pod- and kernel-size distributions of the two new varieties. The amount of dirt removed from the two new varieties was greater than from the 'Argentine' peanuts, probably because the 'Argentine' peanuts were in the windrow longer than 'Spancross' or 'Tifspan'. Observations at the South Georgia Branch Station indicate that 'Spancross' tends to retain less dirt than 'Argentine' or 'Tifspan'.

### Pod and Hull Properties

Pod and broken pods were determined by dye stains on the inside of the hulls of kernels after the pods had been imbedded in a dye solution, dried, and hand shelled. Percentages of cracked or broken pods were 38.7 and 38.7 for the 'Argentine', 'Spancross', and 'Tifspan' peanuts, respectively. Similar percentages for 'Early Runner' and 'Florunner' peanuts were 5.3 and 38.7 percent, respectively. Pod damage undoubtedly occurred in the pods (5, 10, 11). However, the relative value

and extent of pod damage for all varieties were less than that normally found in mechanically-picked peanuts and indicated that good harvesting practices had been used. Pod damage was usually restricted to the apical end of the pod. The higher values of pod damage and higher shelling rates shown by the two new varieties probably resulted from their characteristic thin hull and pod shape. The differences in hull damage between 'Argentine' and these new varieties would be greater than reported here, if the data were adjusted for the effects on hull damage reported by the literature (5, 10, 11) of kernel moisture content at picking and time in the windrow see table 1.

A representative sample of each variety was divided into five pod-shape categories as shown in figure 2. 'Tifspan' and 'Spancross' pods had similar shapes except that 'Spancross' peanuts had slightly more tapered pods (table 5). 'Tifspan' and 'Spancross' pods had fewer normal, tapered and one-seeded pods, but more constricted and odd-shaped pods than 'Argentine' peanuts. The maximum intercalary shell depression between the two seed cavities averaged about 0.038 inches for the constricted pods of all three varieties. According to the literature (7), two-seeded varieties have about 7 percent of the ovules that fail to be pollinated and an additional 10 percent abort during the growth period resulting in about 17 percent of the fruit being one seeded. However, the 'Tifspan' and 'Spancross'

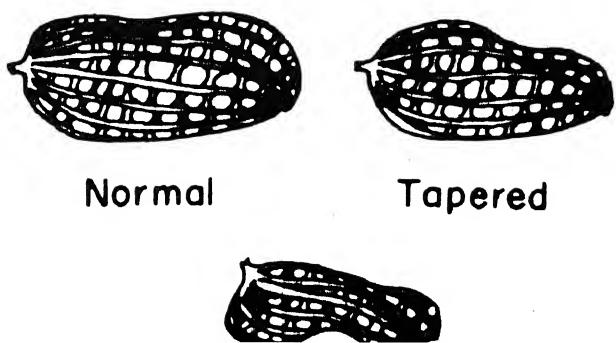
TABLE 4.—*Composition of materials removed during precleaning of peanuts, in percent of net Farmers' Stock*

Variety	Foreign materials removed by cleaner					Estimate of LSK prior to cleaning (official grade)
	Sticks	Light trash	Dirt	Rocks	Total	
'Argentine'	4.1	1.1	0.3	4.8	10.3	1
'Spancross'	1.8	1.2	0.5	0.8	4.3	2
'Tifspan'	1.5	0.8	0.8	1.6	4.7	1
LSK removed by cleaner (red tag)	Estimate of foreign material prior to cleaning (official grade)		Small whole kernels in red tag LSK		Nubbins in red tag LSK	
'Argentine'	0.4	10	0.081	0.014		
'Spancross'	0.3	4	0.109	0.022		
'Tifspan'	0.3	5	0.122	0.010		

peanuts were more efficient in producing two-seeded pods and had only half as many one-seeded pods as the 'Argentine' peanuts. Generally, one-seeded pods and tapered pods are more difficult to damage or shell. A relatively low percentage of one-seeded and tapered pods plus the relatively thin hulls of the 'Spancross' and 'Tifspan' peanuts probably accounted for their high (compared to 'Argentine') pod damage and shelling rates.

'Spancross' and 'Tifspan' peanuts had smaller diameters but longer pods than 'Argentine'. Previous research has shown that shelling efficiencies for a particular grate size are directly proportional to pod diameter, and thus for the same grate size the shelling efficiencies for 'Spancross' and 'Tifspan' peanuts were expected to be lower than for 'Argentine' peanuts. The pod size data appeared to best fit a normal distribution (fig. 3). Peanuts of the three varieties had about the same pod count per pound, pod bulk density, and hull bulk density. Hulls of the 'Spancross' and 'Tifspan' peanuts were slightly thinner than the hulls of 'Argentine' peanuts. Thinner hull varieties are generally more susceptible to mechanical damage, and have higher kernel outturns and higher shelling rates than thicker hull varieties (6).

same for all three varieties. The average difference between the width and thickness of the kernels was approximately 2/64-inch, being slightly greater for the large kernels and slightly less for the small kernels (table 6).



### Kernel (Seed) Properties

General kernel shape was approximately the

TABLE 5.—*Some physical properties of the pods and hulls of 'Argentine', 'Spancross', and 'Tifspan' peanuts*

Variety	Pod property					Length <sup>1</sup>	
	Shape (% by wt)		Constricted	One-seeded	Odd-shaped	Length <sup>1</sup>	
	Normal	Tapered				Average	Range
'Argentine'	63.5	11.6	2.7	13.0	2.4	0.832	0.593-0.079
'Spancross'	70.3	10.6	15.3	6.0	5.5	.842	.547-1.131
'Tifspan'	62.7	6.9	16.6	7.9	5.0	.872	.644-1.206

Variety	Pod property (continued)			Hull property			Bulk density (lb/ft <sup>3</sup> ) <sup>3</sup>	
	Width <sup>2</sup>		Count/lb	Bulk density (lb/ft <sup>3</sup> )	Thickness (in.)			
	Average	Range			Average	Range		
'Tifspan'	0.444	0.310-0.599	576	19.6	0.035	0.014-0.062	5.0	
'Spancross'	.438	.270-.593	580	20.5	.030	.009-.060	5.0	
'Argentine'	.428	.274-.570	561	19.1	.034	.018-.056	5.1	

<sup>1</sup> Does not include one-seeded or odd-shaped pods.

<sup>2</sup> Does not include odd-shaped pods.

<sup>3</sup> Does not include one-seeded pods.

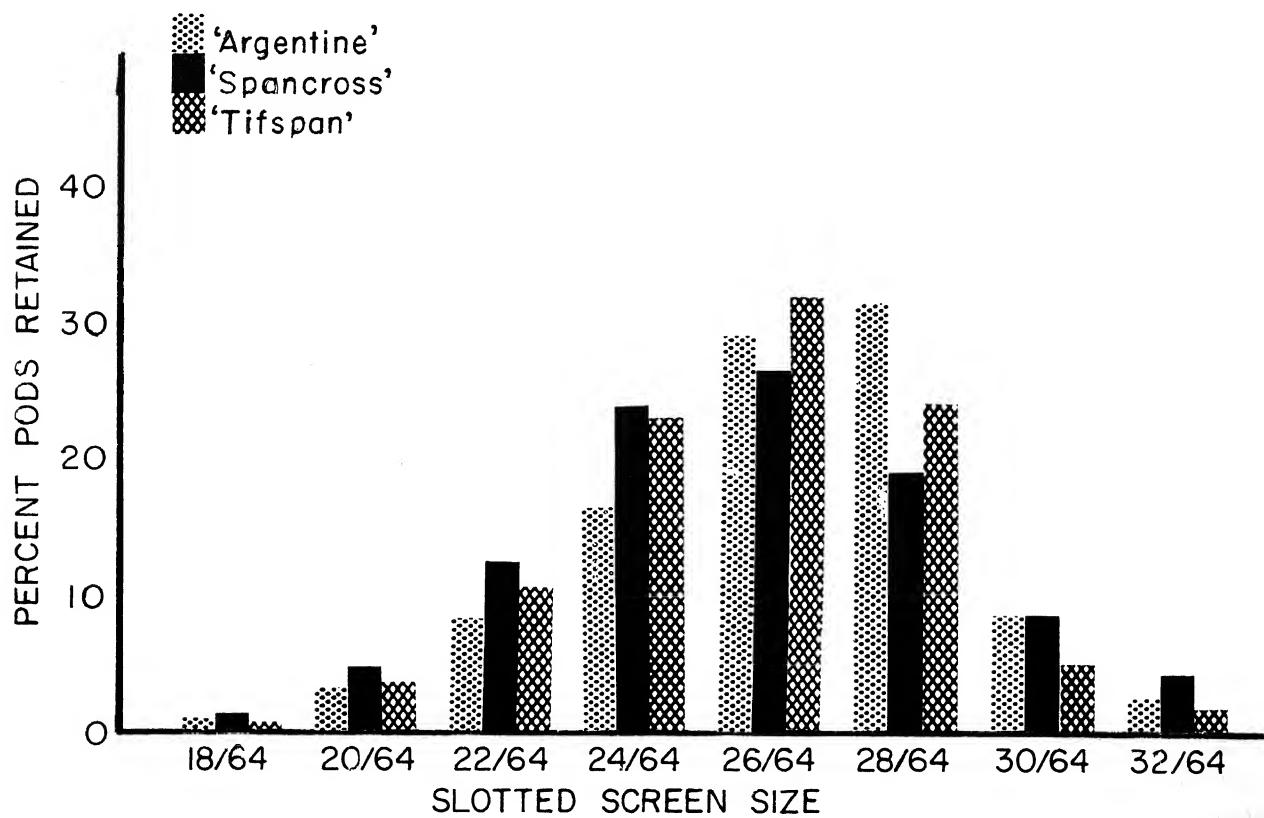


FIGURE 3.—Pod size distribution of 'Argentine', 'Spancross', and 'Tifspan' peanuts in 1971 (pods retained on one screen, but falling through the next larger size.)

TABLE 6.—Some physical properties of 'Argentine', 'Spancross', and 'Tifspan' kernels

Variety	Length (inches)		Width (inches)		Thickness (inches)	
	Average	Range	Average	Range	Average	Range
'Argentine'	0.403	0.199-0.626	0.308	0.147-0.498	0.269	0.108-0.358
'Spancross'	.409	.192- .633	.306	.136- .450	.267	.069- .395
'Tifspan'	.412	.201- .720	.294	.136- .421	.260	.078- .357
Count/lb.						
	Total	Retained on 15/64 in. slotted screen		Bulk density (lb./ft. <sup>3</sup> )		Color <sup>1</sup> raw skin
'Argentine'	1397	1273		42.33	Excellent	Darkest
'Spancross'	1433	1270		42.42	Excellent	Lightest
'Tifspan'	1362	1227		42.94	Excellent	Intermediate

<sup>1</sup> Color evaluations made by Jack L. Pearson, research horticulturist, National Peanut Research Laboratory.

The kernel size data showed an approximately normal distribution, similar to that obtained for the pods (fig. 4). The kernels of 'Spancross' and 'Tifspan' had smaller diameters but were longer

than the kernels of 'Argentine' peanuts. 'Tifspan' had the longest and smallest diameter kernels, a slightly lower kernel count per pound, and slightly higher kernel bulk density than 'Span-

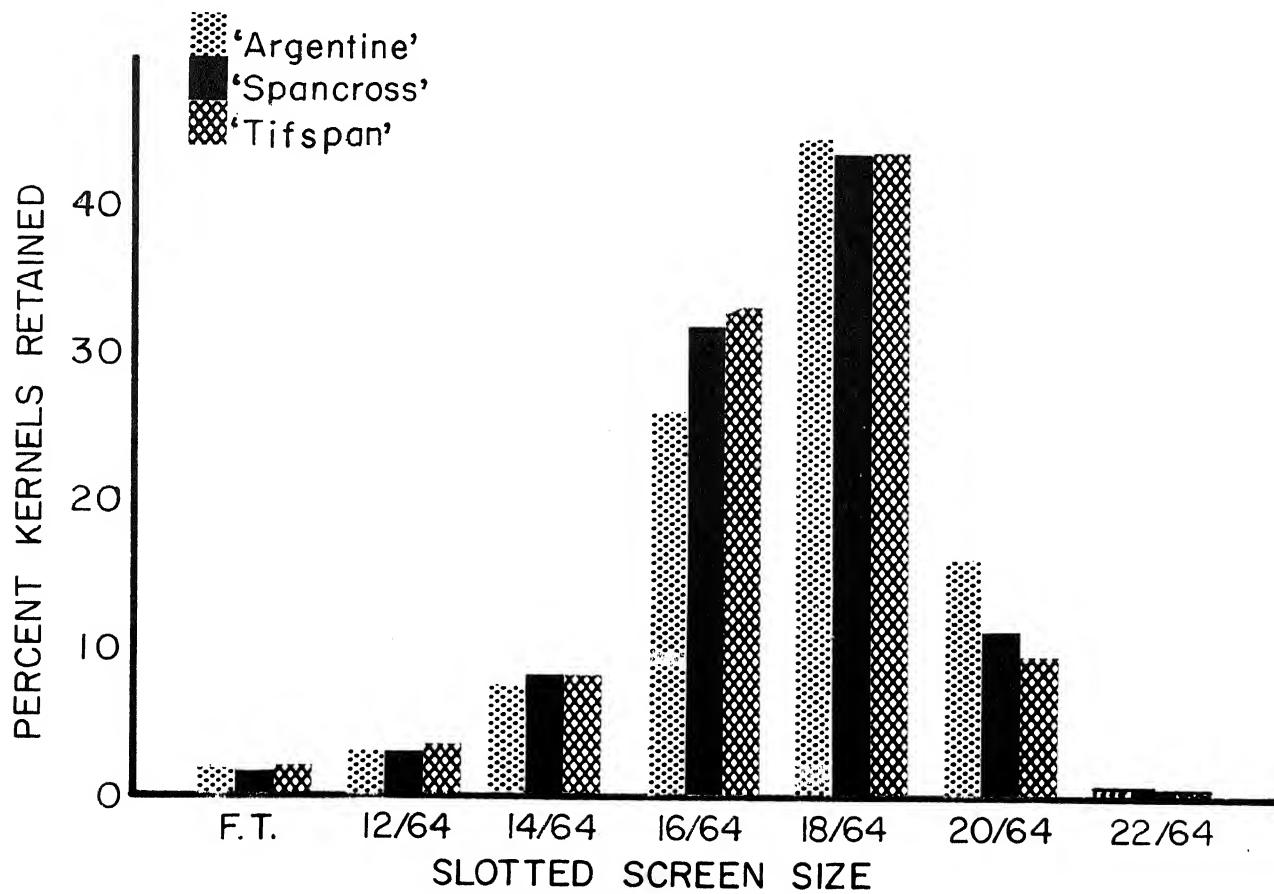


FIGURE 4.—Kernel size distribution of 'Argentine', 'Spancross', and 'Tifspan' peanuts in crop year 1971 (kernels retained on one screen, but falling through next larger size)

cross' and 'Argentine'. Because of their smaller average kernel size, the new varieties would tend to have a lower SMK and a higher percentage of kernels near the 15/64-inch screen size than 'Argentine'. The effects of such variables as harvest dates, and shrinkage, on percent of kernels (SMK) retained on this screen will be slightly greater for the new varieties than for 'Argentine'. However, the average kernel sizes of the new varieties are larger than 'Starr' (another common variety) and the SMK and the effects of such variables on SMK for the new varieties should be between that experienced for 'Argentine' and 'Starr'.

Kernels of all three varieties had a very satisfactory appearance. 'Spancross' had a significantly lighter skin color than 'Argentine' and 'Tifspan' kernels. Differences in raw skin color may have resulted from slight differences in windrow exposure. In replicated (2 replications) comparisons of these varieties, Pearson (8) found none significantly lighter or darker than the others in the 1968 or 1969 crops.

Germination percentages were high for all three varieties of peanuts (table 7). However, germination percentages were higher for 'Spancross' and 'Tifspan', and appeared to be less sensitive to machine shelling and grate-size selection than 'Argentine' peanuts.

### Shelling Data

Generally, 'Spancross' and 'Tifspan' had better shelling properties than 'Argentine' peanuts (table 8). 'Spancross' peanuts had the highest meat (total seed) outturn and the highest market value; 'Tifspan' had the lowest meat outturn and the lowest market value. The shelled peanuts were sized and graded (2) to meet the latest marketing standards. Split kernel, bald kernel and oil stock outturns were lower for 'Tif-

span' and 'Spancross' than for 'Argentine' peanuts. Shelling outturns of kernels tendered to Commodity Credit Corporation were approximately the same for all three varieties. Best grate size selection (of those studied) for a three varieties for obtaining maximum whole kernel outturn was 24/64-, 22/64-, and 20.5/64 inch in the first, second, and third stages of shelling, respectively. 'Argentine' shelling outturns were affected more by small grate sizes than those of the two new varieties. The 'Argentine' kernels were larger in diameter and did not pass through the grate openings as easily as kernels of 'Spancross' and 'Tifspan'.

Shelling rates for 'Spancross' and 'Tifspan' were 13 to 15 percent higher than for 'Argentine' peanuts, probably resulting from the characteristic pod shape (the low percentages of one-seeded pods and tapered pods) and thin hulls. Shelling rate was relatively independent of grate size for all three varieties.

Shelling efficiencies were lower for 'Spancross' and 'Tifspan' than for the 'Argentine' peanuts primarily because the pods of the 'Spancross' and 'Tifspan' peanuts were smaller in diameter and passed more easily through the grate openings.

A screen with 22/64-inch wide by 5/8-inch long slots was the most effective of all screen (slot) sizes tested for separating shelled and unshelled peanuts that pass from the first stage sheller (table 9). This size screen was more effective for the two new varieties than for 'Argentine' and if not overloaded or clogged, will allow very few (less than 0.1 percent) of the kernels to pass into the second stage sheller. Although the pods and kernels of 'Spancross' and 'Tifspan' were smaller than 'Argentine' pods and kernels, the differences in size were not enough to warrant the use of different screen and grate sizes for each variety.

TABLE 7.—Germination percentages of 'Argentine', 'Spancross', and 'Tifspan' seed

Type of shelling	Sheller grate sizes <sup>1</sup>			Germination (percent)		
	Stage 1	Stage 2	Stage 3	'Argentine'	'Spancross'	'Tifspan'
Hand	—	—	—	91.6	98.2	98.4
Machine	24	22	20.5	84.4	93.3	90.6
Machine	22	20.5	19	82.2	93.8	92.0

<sup>1</sup> Grate sizes expressed in sixty-fourths of an inch.

TABLE 8.—*Shelling data for 'Argentine', 'Spancross', and 'Tifspan' peanuts*

Variety and grate combination <sup>1</sup>	Composition of peanut kernels in percent					
	Kernel moisture at shelling	U.S. No. 1 kernels	Splits	CCC large kernels	CCC small kernels	Oil stock
'Argentine'	6.8					2.7
A.....	6.8	53.1	9.1	3.5	1.5	
B.....		49.5	12.6	3.5	1.5	3.8
'Spancross'	6.8					4.2
A.....	6.8	56.6	8.1	3.6	1.5	
B.....		56.3	8.9	3.6	1.5	2.7
'Tifspan'	6.8					2.8
A.....	6.8	57.1	6.4	3.5	1.5	
B.....		55.4	8.3	3.5	1.5	2.6

Composition of peanut kernels in percent (continued)						
	Bald kernels	Total meat outturn	Shelled value/T farmers' stock (\$)	1st stage sheller efficiency (%)	1st stage shelling rate (lb/hr)	
'Argentine'						
A.....	3.2	74.5	297.91	91.3		1510
B.....	3.6	74.5	297.91	96.5		1550
'Spancross'						
A.....	2.0	74.8	303.17	86.6		1740
B.....	2.0	74.8	303.17	93.9		1780
'Tifspan'						
A.....	1.9	73.2	296.84	83.8		1730
B.....	2.0	73.2	296.84	93.8		1720

<sup>1</sup> Grate combination A was 24/64-, 22/64-, and 20.5/64-inch in 1st, 2nd, and 3rd stages of shelling. Combination B was 22/64-, 20.5/64-, and 19/64-inch in the 1st, 2nd, and 3rd stages.

TABLE 9.—*Separation of shelled from unshelled peanuts after first stage sheller*

Variety	Grate combination <sup>2</sup>	% retained on screens <sup>1</sup>					
		22/64	20/64	18/64	24/64	22/64	20/64
'Argentine'	A	0.09	8.89	31.93			
	B	.06	7.06	31.36			
'Spancross'	A	.09	8.04	34.41			
	B	.00	8.03	34.37			
'Tifspan'	A	.07	7.61	35.23			
	B	.00	5.81	32.55			

<sup>1</sup> Calculated on net farmers' stock.

<sup>2</sup> Grate combination A: 24/64-, 22/64-, and 20.5/64-inch in the 1st, 2nd, B: 22/64-, 20.5/64-, and 19/64-inch in 1st, 2nd, and 3rd stages.

## CONCLUSIONS

Generally, the physical and shelling properties of 'Spancross' and 'Tifspan' were similar (including germination), and often superior to those of 'Argentine' peanuts. Thus, no serious problems are expected in commercial shelling of

these peanuts the farmers s the same for value per ton 'Spancross' pe span' peanuts to total meat

The following properties were approximately the same for all three varieties: (1) Bulk density of farmers stock, (2) bulk density of hulls, (3) bulk density of kernels (seeds), (4) count per pound of pods (two-seeded pods), (5) count per pound of kernels, (6) variation in kernel shape, and (7) percent of kernels tendered to CCC.

'Spancross' and 'Tifspan' had fewer one-seeded and tapered pods, and thinner hulls than the 'Argentine' peanuts. Apparently, these pod shapes and hull characteristics make the 'Spancross' and 'Tifspan' pods more susceptible than 'Argentine' pods to mechanical damage. Although these characteristics result in high shelling rates and high meat outturns, they are often considered undesirable because they make the peanuts more susceptible to damage by mold and insects.

Pod and kernel size distributions were approximately normal for all three varieties, but the average pods and kernels of 'Spancross' and 'Tifspan' were smaller in diameter and longer than those of 'Argentine' peanuts. The differences in pod diameters among the varieties resulted in differences in shelling efficiencies, the varieties with the smaller pod diameters ('Spancross' and 'Tifspan') having the lower shelling efficiencies. The differences in kernel diameters between the varieties appeared to result in differences in the effects of grate size selection on whole kernel outturns—grate size selection being less critical for the small-seeded varieties, 'Spancross' and 'Tifspan.'

The slightly thinner hull of the new varieties would tend to produce slightly higher total kernel (meat) and SMK outturns than for the thicker-hulled 'Argentine' variety. However, an increase in SMK resulting from the thinner hulls of the new varieties would be offset by their smaller kernel size distribution. Since 'Tifspan' has the smallest average kernel size of the three varieties it will probably also have the lowest percentage of kernels retained on the 15/64-inch slotted screen.

The skins (testa) and cotyledons of 'Spancross' and 'Tifspan' were more cohesive than the skins and cotyledons of 'Argentine' and their kernels were less susceptible to skinning and splitting than the kernels of 'Argentine' peanuts. Although some of the difference in cohesiveness of the skins and kernels may be attributed to slight variations in length of exposure in the

windrow and differences in kernel moisture content at picking time, most of the differences in milling quality reported here are probably genetic.

Although there were differences in properties of the three varieties, the differences noted were not enough to warrant the use of different grate and screen sizes. Grates and screens used for shelling 'Argentine' should be adequate for shelling 'Spancross' and 'Tifspan' peanuts. For all of these peanuts the best grate size combination of those studied was 24/64-, 22/64-, and 20.5/64-inch in the first, second, and third stages of shelling, respectively. The best slotted hole screen size for scalping off the large unshelled peanuts and passing the shelled peanuts was a 22/64-inch wide by 5/8-inch long slotted hole screen.

## RECOMMENDATIONS

Physical and shelling properties of these peanuts will vary from lot to lot because of differences in soil, climate, cultural practices, etc., but these data should be fairly representative for 'Argentine', 'Spancross', and 'Tifspan' peanuts when recommended practices are used and no abnormal crop conditions are encountered.

Most of the physical and shelling properties of 'Tifspan' and 'Spancross' were similar and prior research on 'Argentine' and 'Starr' peanuts indicate that many of the physical and shelling properties of 'Tifspan' and 'Spancross' peanuts are intermediate between those of 'Starr' and 'Argentine' peanuts. Thus, the knowledge obtained by industry through past experience in shelling 'Argentine' and 'Starr' peanuts (common varieties) and the information contained herein should be very helpful in the commercial shelling of these peanuts.

Based on this study the following additional recommendations are offered for improving the precleaning, handling and shelling of these peanuts:

(1) Use sand screens or similar machines to remove dirt from the farmers stock peanuts prior to shelling to minimize the loss of sound split kernels to oil stock as a result of "dirty face splits." Such machines are warranted for shelling varieties whose pods have high dirt-retaining ability.

(2) Use machines to remove nubbins and whole kernels from the LSK (red tag), especial-

ly for peanut varieties that have relatively small pod and kernel size distributions.

(3) Use gentle handling practices and equip-

ment to offset the relatively high susceptibility of 'Spancross' and 'Tifspan' peanuts to mechanical damage.

## LITERATURE CITED

(1) Beavers, John  
1959. Some physical characteristics of the Spanish peanut pod and kernel. Unpublished M. S. Thesis, Okla. State Univ., 30 p.

(2) Grange, G. R.  
1965. U. S. Standards for grades of shelled Spanish-type peanuts. U.S. Dept. Agric. Circ. No. 30 F. R. 7595.

(3) Hammons, Ray O.  
1970. Spancross—A new peanut variety. Univ. of Ga. Res. Rep. No. 76.

(4) Hammons, Ray O.  
1970. The Tifspan peanut variety. Univ. of Ga. Res. Rep. No. 77.

(5) Khalsa, J. S.  
1965. Harvesting damage to peanuts. M. S. Thesis, North Carolina State Univ.

(6) McIntosh, Freddie P. and James I. Davidson, Jr.  
1971. Selected physical and shelling properties of Florunner peanuts. U. S. Dept. Agric., Agric. Res. Serv. (Rep.) ARS 52-68.

(7) N. C. Agric. Exp. Stn.  
1946. Peanuts. N. C. Agric. Exp. Stn., 69th Ann. Report, pp 37-47.

(8) Pearson, Jack L.  
1969. Quality evaluation of Argentine, Starr, Ga. C325, and Ga. Cl-27 peanuts. Unpub-

lished report to the Peanut Variety Recommendation and Release Committee of the Georgia Peanut Planning Group.

(9) Soong, Stassen, Y. C.  
1959. Some physical and chemical characteristics of peanut pods and kernels in an irrigation study. M. S. Thesis, Okla. State Univ., 33 p.

(10) Stansell, J. R., Butler, J. L., and Shepherd, J. L.  
1968. The effect of mechanical harvesting on peanut hull and kernel damages. Presented at SE Region, Amer. Soc. Agric. Eng. Meeting, Louisville, Kentucky.

(11) Stansell, J. R., Butler, J. L., and Shepherd, J. L.  
1970. Effect of windrow orientation and exposure times on peanut harvesting damage. Presented at SE Region, Amer. Soc. Agric. Eng. Meeting, Memphis, Tenn.

(12) Steele, J. L., F. S. Wright, and P. H. van Schaik.  
1972. Certain physical and mechanical properties of Virginia 61R peanuts. J. Amer. Peanut Res. E. Assoc., Inc., Vol. 4, No. 1 pp 108-119.

(13) U. S. Dept. of Agric.  
1971. Inspection instructions for farmers stock peanuts. U. S. Dept. Agric., Consumer Mark. Serv. (revised), 34 p.